

¹⁴C SAMPLE PREPARATION FOR ANALYSIS BY TANDEM
ACCELERATOR MASS SPECTROMETER (TAMS)

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ABSTRACT

State-of-the-art ¹⁴C gas counting techniques are capable of measuring ages of 40,000-50,000 years from samples containing a few grams of carbon. Low background counters and isotopic enrichment techniques have extended the range of gas counting techniques to samples as old as 60,000 years, and for modern samples 1 g miniature gas counters can utilise as little as 20-100 mg of carbon.

With the advent of radiocarbon dating by TAMS, even smaller samples may be dated, for example, 5-20 mg of carbon with ages as old as 70,000 years. In addition, the TAMS analysis of very old samples may be completed in a few hours as compared to the weeks required by conventional gas counters. However, a host of technical problems remain to be solved before radiocarbon dating using the TAMS technique can be said to be routine.

For example, the preparation of samples suitable for use as targets in accelerator sputter ion sources, poses several chemical and physical problems. The best targets developed so far are those incorporating the carbon to be dated in the form of graphites or carbides, although some successes have been reported using compressed charcoals.

The conversion of wood, charcoal or bones into graphites or carbides is a non-trivial problem. We are currently investigating target preparation techniques for radiocarbon dating using several methods, amongst which are graphitisation using catalysts, preparation of carbon black and cracking of carbon-containing gases using glow discharges. The results and relative merits of the techniques will be discussed.